



*Revised  
Front end.*

*MS*



## **IVHS ARCHITECTURE DEVELOPMENT**

### **REGIONAL FORUM RESULTS**

**June 1994**

## Table of Contents

|                           |        |
|---------------------------|--------|
| FOREWORD .....            | ii     |
| EXECUTIVE SUMMARY .....   | ES-1   |
| INTRODUCTION              |        |
| Background .....          | I-1    |
| Purpose .....             | I-3    |
| Structure .....           | I-3    |
| Terms of Reference .....  | I-4    |
| Caveats .....             | I-5    |
| NATIONAL PERSPECTIVE      |        |
| Stakeholder Profile ..... | II-1   |
| Feedback Results .....    | II-3   |
| Forum Evaluation .....    | II-4   |
| Lessons Learned .....     | II-6   |
| Conclusions .....         | II-7   |
| REGIONAL PERSPECTIVES     |        |
| Atlanta .....             | III-1  |
| Washington DC .....       | III-4  |
| Boston .....              | III-7  |
| New York .....            | III-10 |
| Chicago .....             | III-13 |
| Kansas City .....         | III-16 |
| Dallas .....              | III-19 |
| Denver.. .....            | III-22 |
| San Francisco .....       | III-25 |
| Seattle .....             | III-28 |
| FORUM SUMMARIES           |        |
| Atlanta.. .....           | APP-A  |
| Washington, DC .....      | APP-B  |
| Boston .....              | APP-C  |
| New York .....            | APP-D  |
| Chicago .....             | APP-E  |
| Kansas City .....         | APP-F  |
| Dallas .....              | APP-G  |
| Denver .....              | APP-H  |
| San Francisco .....       | APP-I  |
| Seattle .....             | APP-J  |

## FOREWORD

link to program

This document summarizes stakeholder feedback from ten regional architecture forums conducted from April 21 through May 11, 1994. A written form was the primary means for obtaining input. Each architecture forum also provided the opportunity for participants to discuss questions and issues, *in an open microphone* format. A set of ten appendices at the end of this report capture these questions and issues, however, the analysis and results of stakeholder feedback focus on written input.

The introduction of this status report, section I, includes some strong caveats to help avoid misunderstanding the significance and relevance of the results. The reader should keep in mind that feedback results may not accurately portray all of the most important IVHS system architecture issues. The results attempt to accurately portray trends in perceptions, according to those stakeholders providing feedback.

## EXECUTIVE SUMMARY

During the period from April 21 through May 11, 1994, the consensus building team conducted ten public forums. Primary goals for these IVHS architecture meetings included: educating stakeholders on IVHS in general and system architecture in particular and listening to stakeholders' concerns, needs, and issues. Although the architecture development process is still in its early stages, these forums served as a means for the consensus building and architecture development teams to improve our understanding of the ultimate IVHS providers and users.

The IVHS architecture forums served as a cost-effective outreach to approximately 1200 stakeholders. Public sector and private sector representation was balanced, totaling 80% of all participants. The private sector dominated the first five architecture forums in Atlanta Washington DC, Boston, New York, and Chicago. Conversely, public sector stakeholders constituted a majority in the last five forums (Kansas City, Dallas, Denver, San Francisco, and Seattle). Few of the forums had strong representation from policy-makers, with the possible exception of Atlanta. This forum was unique because of its scheduling, in conjunction with IVHS AMERICA's annual meeting. Exhibit ES-1 summarizes forum attendance.

**Exhibit ES-1. Forum Attendance**

|               | Public | Private | Users /<br>Fleets | National<br>Interests | Total |
|---------------|--------|---------|-------------------|-----------------------|-------|
| Atlanta       | 37     | 105     | 12                | 60                    | 214   |
| Washington    | 22     | 80      | 7                 | 41                    | 150   |
| Boston        | 28     | 47      | 4                 | 12                    | 91    |
| New York      | 41     | 50      | 3                 | 12                    | 106   |
| Chicago       | 45     | 52      | 2                 | 20                    | 119   |
| Kansas City   | 46     | 18      | 3                 | 8                     | 75    |
| Dallas        | 56     | 29      | 3                 | 15                    | 103   |
| Denver        | 35     | 17      | 2                 | 4                     | 58    |
| San Francisco | 60     | 39      | 7                 | 9                     | 115   |
| Seattle       | 83     | 37      | 2                 | 5                     | 127   |
| Total         | 453    | 474     | 45                | 174                   | 1158  |

The regional forums seemed to generate enthusiasm for the architecture development program and the consensus building process. Over three quarters of stakeholder feedback identified an interest in returning to consensus building forums this Fall. Just under three quarters of the feedback said stakeholders will encourage colleagues to participate during the next review.

The results of the regional forums focus on written stakeholder input. Deployment, Standards, and Policy & Regulation, in descending order, were the top three implication areas that stakeholders raised most frequently. As broad categories, each of these implications include more specific issues. Important factors within the deployment category include:

- Speeding the pace towards deployment
- Preferring flexibility over simplicity in an architecture
- Prioritizing user needs over technology
- Exploiting existing infrastructure
- Emphasizing local participation and decisions.

Standards represent a focused and more straightforward implication area. Stakeholders identified the importance of standards for national compatibility and product development. During panel discussions stakeholders stated a desire to generate a set of common standards with organizations like the Society of Automotive Engineers (SAE) and the Institute of Electrical and Electronics Engineers (IEEE), as soon as practical.

Intermodalism, environment, liability, and voluntary participation were the primary issues raised within the policy & regulation implication area. Stakeholders identified both freight and passenger components of intermodalism as important. Exhibit ES-2. lists top implications by stakeholder category.

**Exhibit ES-2. Top Implications**

| Public     | Private    | Uses / Fleets | National Interests | Cumulative |
|------------|------------|---------------|--------------------|------------|
| Deployment | Deployment | Standards     | Deployment         | Deployment |
| Standards  | Standards  | Equity        | Pol & Reg          | Standards  |
| Pol & Reg  | Pol & Reg  | Deployment    | Standards          | Pol & Reg  |

The lessons learned from conducting ten architecture forums during IPR suggest the need for some focused, controlled means of obtaining stakeholder feedback. A structured workshop can provide a way of supplementing regional architecture forums. This workshop can provide three important features:

- IVHS AMERICA and the U.S. Department of Transportation can exploit their institutional positions to invite knowledgeable stakeholders, especially policy-makers, for the single purpose of providing feedback.
- Invited participants would constitute a balanced set of stakeholder interests.
- Tailored presentations to specific stakeholder groups would provide the opportunity for substantive interaction with stakeholders.

Regional forums could serve as first order validation of workshop results, while continuing the architecture outreach and education process for a large number of stakeholders.

## INTRODUCTION

### Background

An Intelligent Vehicle-Highway Systems (IVHS) Architecture will provide the essential framework for ensuring national compatibility, integrating a diverse set of user services, allowing regional and local deployment decisions, and permitting service and technology evolution. Stakeholder needs drive many of the challenges associated with developing this architecture.

The United States Department of Transportation (USDOT) and IVHS AMERICA, as the consensus building team, worked closely with approximately 40 national-level associations and interest groups with diverse backgrounds to identify a list of very broad technical, financial, legal, institutional, and political ramifications to stakeholders. Stakeholders include all of those who design, build, operate, maintain, and use IVHS systems and services; and those special interests whom IVHS may impact. In short, we are all stakeholders. The resulting list of ten *implications* provided the baseline for soliciting feedback from stakeholders concerning a national architecture:

- **Deployment** – impact on the rate of IVHS deployment
- **Equity** – distribution of costs and benefits
- **Financing** – impact on financing deployment, operations, and maintenance
- **Institutions** – roles and responsibilities of institutions and organizations
- **Market** – development of an IVHS market and effects on related markets
- **Operations & Maintenance (O&M)** – IVHS O&M concerns
- **Policy & Regulation** – effect on implementing current and future legislation and regulations
- **Privacy** – impact on individual privacy and organizational confidentiality
- **Safety** – IVHS system safety concerns
- **Standards** – development of current and future standards and protocols.

During the period from April 21 through May 11, 1994, the consensus building team conducted ten public forums. Primary goals for these IVHS architecture meetings included: educating stakeholders on IVHS in general and system architecture in particular and listening to stakeholders' concerns, needs, and issues. Although the architecture development process is still in its early stages, these forums served as a means for the consensus building and architecture development teams to improve our understanding of the ultimate IVHS providers and users. Exhibit I-1 shows the schedule and location for these forums.

**Exhibit I-1. Architecture Forums**

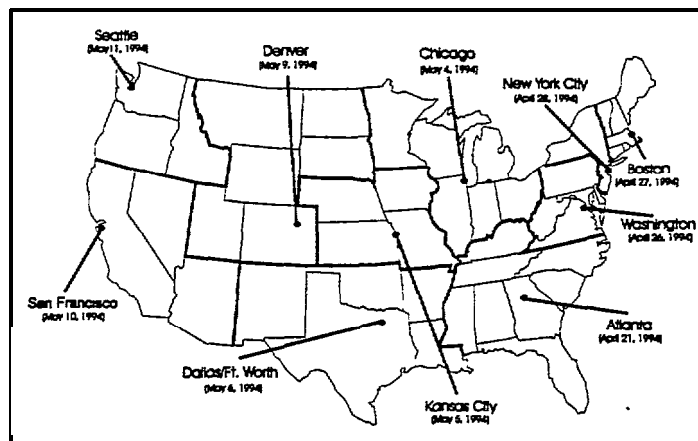


Exhibit I-2 shows the agenda for the last nine architecture forums. The first regional forum, in Atlanta Georgia, focused less on the architecture development teams and their concepts, and more on the implication areas. Stakeholders strongly suggested a change in that emphasis for subsequent meetings. The morning session for the remaining nine meetings focused on implication areas and user services, concluding with a question and answer session. The afternoon featured the architecture development teams, allowing personal interaction with stakeholders.



## Exhibit I-2. Forum Agenda

|                      |  |
|----------------------|--|
| <b>8:30 - 8:45</b>   | <b>Welcome /Opening Remarks</b>              |
| <b>8:45 - 9:15</b>   | <b>IVHS Architecture Video</b>               |
| <b>9:15 - 9:40</b>   | <b>User Services</b>                         |
| <b>9:40 - 10:00</b>  | <b>IVHS Architecture Development Program</b> |
| <b>10:00 - 10:30</b> | <b>Break</b>                                 |
| <b>10:30 - 11:00</b> | <b>Implications</b>                          |
| <b>11:00 - 11:30</b> | <b>Panel Discussion</b>                      |
| <b>11:30 - 1:00</b>  | <b>Lunch</b>                                 |
| <b>1:00 - 2:30</b>   | <b>Team Presentations</b>                    |
| <b>2:30 - 3:00</b>   | <b>Break</b>                                 |
| <b>3:00 - 4:00</b>   | <b>Panel Discussion</b>                      |

### Purpose

This report highlights the trends in stakeholder preferences and perceptions in each of ten regions, and across the nation as a whole, as we currently understand them. Regional forum information, in conjunction with feedback from IVHS AMERICA's committees and the consensus task force, will help refine architecture development activities for the rest of phase I and into phase II.

### Structure

The material in this document presents oral and written stakeholder input. Its structure organizes complex information into simple results and supporting details.

The national perspective section of this document (section II) includes a stakeholder profile and cumulative written feedback results as they pertain to the ten implication areas. The section serves as a concise summary for the reader.

The regional perspective section (section III) and appendices (A-J) offer more details about feedback and forums, respectively. Regional perspectives include stakeholder profiles and a focused look at the most frequently mentioned stakeholder implications (broad) and issues (specific). The appendices, at the end of this report, encapsulate open microphone discussions at each of the ten forums and include an attendance list.

## **Terms of Reference**

Throughout this report certain terminology helps concisely identify stakeholders for text and exhibits alike. The consensus building team categorizes stakeholders into four sectors, comprising several groups each.

*Public sector infrastructure providers*, identified as public sector stakeholders, include four specific groups:

- Regional and metropolitan planning organizations
- Local government
- State government
- Toll agencies.

*Private sector product and service providers*, identified as private sector stakeholders, constitute four groups:

- Vehicle manufacturers and equipment suppliers
- Information technology product and service providers and Telecommunications
- Construction
- System integrators.

Users and fleet operators, often listed as users and fleets, include:

- public fleet operators
- private fleet operators
- individual travellers.

### **National interests comprise:**

- Federal government
- Public interest groups
- academia

Feedback and forum discussions often identified issues outside the strict definition of system architecture, including: user services, contracting details, education and outreach, and membership on IVHS AMERICA committees and consensus task force. This report categorizes such stakeholder input under the heading *program planning*. Frequently raised program planning issues conclude selected regional forum analyses (section III and appendices) where appropriate.

### Caveats

Three subtle factors effect stakeholder feedback from the ten regional forums:

- Structure of the feedback forms and meetings
- Content and style of the presentations
- Stakeholder representation.

The impact of these factors are difficult to thoroughly quantify, underscoring some important fundamental caveats:

- There is no basis for assigning statistical significance to regional results, especially when considering particular stakeholder groups within the four broader sectors (i.e. public, private, users/fleet operators, and national interests). Cumulative national results offer a larger sample size for the public and private sectors, but IVHS users and fleet operators remain under represented. Therefore, the reader should view all analytical results and conclusions in coarse, qualitative terms.
- The feedback forms were unstructured, leaving many of the interrelationships among implication areas implicit. For example, the relationships among equity, financing, and market implication areas becomes increasingly ambiguous when stakeholders consider questions like *who pays for IVHS?* and *will individual travellers have sufficient access to IVHS services and capabilities?* Private sector stakeholders probably considered such issues within the equity implication category based on their potential financial and market impact.
- The free flow of ideas onto paper (i.e. lack of structure) also makes it difficult to neatly and uniformly categorize feedback comments into implication areas and related issues. This results in a broad implication area, like deployment, having a few specifically identified primary issues in addition to the generic issue of deployment itself. However, a very focused implication area, like standards, presents few twists or variations.

## NATIONALPERSPECTIVE

The national perspective section of this document (section II) includes a stakeholder profile and cumulative written feedback results as they pertain to the ten implication areas. The section serves as a concise summary for the reader. The regional perspective section (section III) and appendices (A-J) offer more details about feedback and forums, respectively.

### Stakeholder Profile

The IVHS architecture forums served as a cost-effective outreach to approximately 1200 stakeholders. Public sector and private sector representation was balanced, totaling 80% of all participants. The private sector dominated the first five architecture forums in Atlanta, Washington DC, Boston, New York, and Chicago. Conversely, public sector stakeholders constituted a majority in the last five forums (Kansas City, Dallas, Denver, San Francisco, and Seattle). Few of the forums had strong representation from policy-makers, with the possible exception of Atlanta. This forum was unique because of its scheduling, in conjunction with IVHS AMERICA's annual meeting.

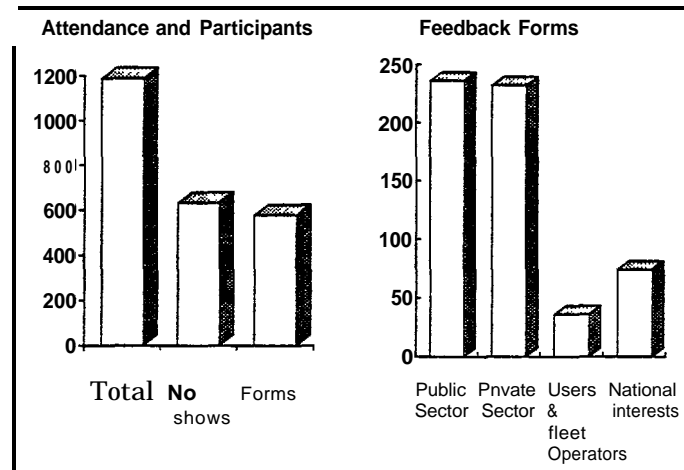
National interests, primarily consisting of the federal government and academia, accounted for 16% of attendees. As one of the groups within the national interests sector, special interests (e.g., environmentalists and consumer advocates) were largely absent from the architecture forums. The Washington DC forum attracted attention from the legislative branch of the federal government, with staff from the Congressional Budget Office, General Accounting Office, and U.S. House of Representatives.

Users and fleet operators only comprised 4% of the national audience. Both freight and passenger types of fleet operators were severely under represented in each of the ten forums. The lack of individual travellers probably reflects the lack of IVHS recognition from the consumer.

The forums in Atlanta and Seattle included international participants from Japan, Europe, and Canada. Informal comments from these representatives indicates strong interest in our systematic approach to developing a national architecture.

The proportion of stakeholder types returning written feedback forms reflected the attendance at the architecture meetings as a whole. Therefore the public and private sector stakeholders strongly and equally influenced the feedback results from a nation-wide perspective. About half the number of total forum participants, who pre-registered, did not show up. This figure is consistent with results of other IVHS outreach forums. On-site registration ultimately increased attendance to pre-registration levels. Roughly one out of every two forum participants submitted written feedback. Exhibits II-1 and II-2 summarize this stakeholder profile and regional attendance.

### Exhibit II-1. Nation-Wide Participation



### Exhibit II-2. Regional Attendance

|               | Public | Private | Users /<br>Fleets | National<br>Interests | Total |
|---------------|--------|---------|-------------------|-----------------------|-------|
| Atlanta       | 37     | 105     | 12                | 60                    | 214   |
| Washington    | 22     | 80      | 7                 | 41                    | 150   |
| Boston        | 28     | 47      | 4                 | 12                    | 91    |
| New York      | 41     | 50      | 3                 | 12                    | 106   |
| Chicago       | 45     | 52      | 2                 | 20                    | 119   |
| Kansas City   | 46     | 18      | 3                 | 8                     | 75    |
| Dallas        | 56     | 29      | 3                 | 15                    | 103   |
| Denver        | 35     | 17      | 2                 | 4                     | 58    |
| San Francisco | 60     | 39      | 7                 | 9                     | 115   |
| Seattle       | 83     | 37      | 2                 | 5                     | 127   |
| Total         | 453    | 474     | 45                | 174                   | 1158  |

## Feedback Results

Deployment, Standards, and Policy & Regulation, in descending order, were the top three implication areas that stakeholders raised most frequently. As broad categories, each of these implications include more specific issues. Important factors within the deployment category include:

- Speeding the pace towards deployment
- Preferring flexibility over simplicity in an architecture
- Prioritizing user needs over technology
- Exploiting existing infrastructure
- Emphasizing local participation and decisions.

Standards represent a focused and more straightforward implication area. Stakeholders identified the importance of standards for national compatibility and product development. During panel discussions at the architecture forums stakeholders stated a desire to generate a set of common standards in conjunction with organizations like the Society of Automotive Engineers (SAE) and the Institute of Electrical and Electronics Engineers (IEEE), as soon as practical.

Intermodalism, environment, liability, and voluntary participation were the primary issues raised within the policy & regulation implication area. Stakeholders identified both freight and passenger components of intermodalism as important. Exhibit II-3 summarizes the top stakeholder concerns on a national scale.

**Exhibit II-3. Nation-Wide Results**

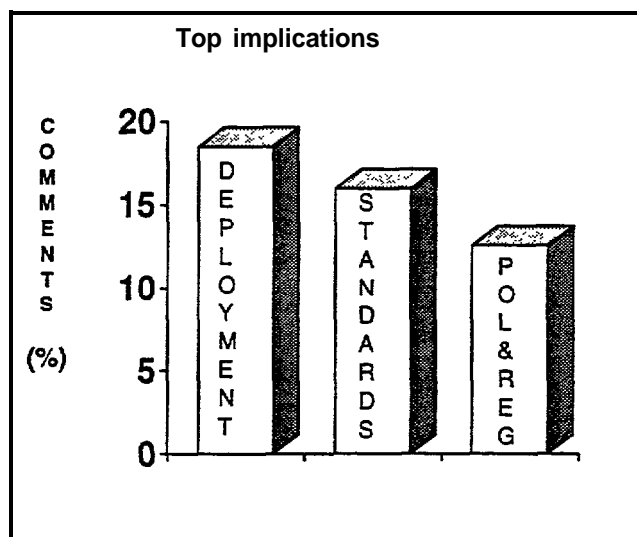


Exhibit II-4 lists the top three implications from feedback forms, according to the frequency that stakeholders raised them. The exhibit highlights trends in stakeholder perspectives given the caveats in section I of this report. These issues account for nearly half of all the input.

The public and private sector rankings are identical. National interests identified the same top three implications as the public and private sectors, but in a different order. Given their limited turn-out, the accuracy and validity of users and fleet operators is questionable, but included for completeness.

**Exhibit II-4. Implication Rankings -Nation-Wide**

| <b>Public</b>        | <b>Private</b>       | <b>Uses /<br/>Fleets</b> | <b>National<br/>Interests</b> | <b>Cumulative</b>    |
|----------------------|----------------------|--------------------------|-------------------------------|----------------------|
| Deployment           | <b>Deployment</b>    | Standards                | Deployment                    | <b>Deployment</b>    |
| Standards            | Standards            | Equity                   | Pol & Reg                     | <b>Standards</b>     |
| <b>Pol &amp; Reg</b> | <b>Pol &amp; Reg</b> | Deployment               | Standards                     | <b>Pol &amp; Reg</b> |

### Forum Evaluation

The regional forums seemed to generate enthusiasm for the architecture development program in general and the consensus building process in particular. Over three quarters of stakeholder feedback identified an interest in returning to consensus building forums this Fall. Almost the identical number characterized the meetings as helpful. Just under three quarters of the feedback said stakeholders will encourage colleagues to participate during the next review. Conversely, only 3% of participants stated that they will not come to the next review.

Almost 85% of stakeholders returning feedback forms described the architecture video primer as informative. 83% and 64% of the feedback described the user services overview and implications briefing as informative and understandable, respectively. Exhibit II-5 lists stakeholder perceptions concerning the architecture forums.

### Exhibit II-5 Nation-Wide Forum Perceptions

| Stakeholder Perceptions         | strongly disagree | disagree | uncertain | agree | strongly agree |
|---------------------------------|-------------------|----------|-----------|-------|----------------|
| I will come next time           | 1%                | 2%       | 18%       | 30%   | 48%            |
| I will encourage others to come | 1%                | 5%       | 21%       | 35%   | 37%            |
| Helpful meeting                 | 1%                | 6%       | 17%       | 44%   | 32%            |
| Informative video               | 1%                | 4%       | 12%       | 40%   | 44%            |
| Information relevant            | 1%                | 7%       | 15%       | 49%   | 27%            |
| User services understandable    | 1%                | 6%       | 11%       | 56%   | 27%            |
| Implications understandable     | 2%                | 7%       | 22%       | 51%   | 17%            |
| Adequate involvement            | 3%                | 9%       | 26%       | 39%   | 23%            |

The following statements offer an abridged contrast of the architecture forums:

- The Atlanta forum had a broad audience, including international participants and knowledgeable stakeholders, due in large part to the IVHS AMERICA annual meeting. The next review cycle will almost certainly differ.
- Washington DC included a strong federal presence, which incidentally served as a *marketing* forum to the legislative branch.
- The New York and Boston forums both included a wide range of discussion topics, with similar results. Stakeholders at the New York forum suggested numerous additions to the consensus task force.
- Chicago and Dallas offered the most program planning input ranging from recommendations for additional consensus task force members to questions about phase II down-select.
- Kansas City and Denver offered a rural and commercial vehicle operations perspective to IVHS. Safety and freight efficiency seem like the best selling points for IVHS **and** the benefits of a system architecture to this community.
- San Francisco and Seattle offered larger stakeholder audiences.



## Lessons Learned

Written and oral feedback highlights four important lessons:

- 1) The closed, or proprietary, aspects of this review cycle hindered consensus building. Presentations from the architecture development teams were generic in nature and lacking substantive details. Stakeholder feedback therefore lacked a proportional element of structure and detail. The fact that the architecture concepts were not fully developed also limited details in the teams' presentations. However, during the next round of consensus forums, the teams' final products will be public domain, encouraging the discussion of ideas and information.
- 2) The ten implication areas served as a useful focal point for stakeholders at the consensus forums. However, each forum dedicated a significant portion of its precious agenda time describing implications. The value of these implications during the final program review may warrant reconsideration, since stakeholder feedback consistently identified a more specific set of issues. The value of the ten implications may reside in its utility as a bundling structure for the administrative needs of USDOT and the consensus task force.
- 3) The consensus building team lacked control over three important elements of the ten architecture forums:
  - Stakeholder Representation  
We must identify a means for obtaining feedback from all stakeholder groups, especially at the policy and decision-making level.
  - Feedback Responses  
In the future we must identify an effective mechanism for obtaining feedback from more stakeholders. During this round of meetings we traded a copy of the IVHS architecture video for feedback forms. The videos did not arrive in time at the Dallas forum, which had a response rate half that of the national average.
  - Presentation Content  
Based on forum results, we must control the content of presentations, tailoring them to specific stakeholder needs and encouraging specific feedback.
- 4) The difference between architecture, implementing design, and policy decisions requires further clarification for stakeholders.

## Conclusions

The lessons learned from conducting ten architecture forums during IPR suggest the need for some focused, controlled means of obtaining stakeholder feedback. A structured workshop can provide a way of supplementing regional architecture forums. This workshop can provide three important features:

- IVHS AMERICA and USDOT can exploit their institutional positions as focal points for IVHS to invite knowledgeable stakeholders (especially decision and policy-makers) for the single purpose of providing feedback.
- Invited participants would constitute a balanced, thorough representation of stakeholder interests.
- Tailored presentations to specific stakeholder groups would provide the opportunity for substantive interaction between stakeholders and the architecture development teams.

The regional forums could serve as first order validation of workshop results, while continuing the IVHS architecture outreach and education process for a large number of stakeholders.